



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

| APPLICATION NO.  | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|--|-------------|----------------------|---------------------|------------------|
| 10/750,059   | 12/30/2003  | Hiroshi Miyazaki     | TI-36833            | 9129             |
| 23494  | 7590        | 10/20/2005           | EXAMINER            |                  |
| TEXAS INSTRUMENTS INCORPORATED<br>P O BOX 655474, M/S 3999<br>DALLAS, TX 75265 |             |                      | LE, THAO X          |                  |
|  |             |                      | ART UNIT            | PAPER NUMBER     |
|  |             |                      | 2814                |                  |

DATE MAILED: 10/20/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/750,059

Applicant(s)

MIYAZAKI, HIROSHI

Examiner

Thao X. Le

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 19 September 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1,3,4,6,8-11,28 and 29 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3,4,6,8-11,28 and 29 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 09/19/05.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 19 Sept. 2005 has been entered.

### ***Claim Rejections - 35 USC § 112***

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 3, 6 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 3 and 6 depend on canceled claims 2 and 5, respectively; thus it is indefinite. Assuming both claims 3 and 6 depend on claim 1 for the purpose of examination.

***Claim Rejections - 35 USC § 102***

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1, 4, 8-11, and 28-29 are rejected under 35 U.S.C. 102(b) as being anticipated by US 6433427 to Wu et al.

Regarding claim 1, Wu discloses an interconnect structure comprising: a substrate 58, col. 7 line 51; a conductive contact pad 84, col. 9 line 41, having a first elastic modulus (pad 84 comprises Al or Cu, col. 9 line 14) disposed over a portion of the substrate surface 58, having an inner portion and an outer portion 68, col. 8 line 14, surrounding the inner portion; a compliant layer 70/71, col. 8 line 56, having a second elastic modulus lower than the first elastic modulus, disposed directly under the inner portion of the contact pad but not under the outer portion of the contact pad, fig. 2I, the portion of the contact pad 84 over the compliant layer 71 having a thickness thinner than the thickness of the outer portion of the contact pad; and an insulative mask 82, col. 9 line 26, disposed over the contact pad 84, including an opening 83, col.9 line 43, that exposes the inner portion of the contact pad 84, fig. 2K.

With respect to 'a second elastic modulus lower than the first elastic modulus', the compliant layer 71 has the modulus of about 10 MPa, col. 8 line 42, while the modulus of the pad 84 comprises copper would have been substantially higher than 10 MPa.

Regarding claim 4, Wu discloses the interconnect structure of claim 1, in which the contact pad comprises copper, column 9 line 14 and the compliant layer 71 comprises a material having an elastic modulus lower than the elastic modulus of copper, see discussion in claim 1.

Regarding claims 8-10, Wu discloses the interconnect structure in which the inner portion of the contact pad 84 is more flexible than the outer portion. Inherently, the thicker portion 68 would be more rigid than the thinner portion 76, wherein the opening 83 uncovers a substantially planar contact surface, fig. 2K, wherein the structure further including a solder contact 86, col. 9 line 45, attached to the contact surface, fig. 2L, the solder contact 86 including a contact portion defined by the opening of the insulative mast 82.

Regarding claim 11, Wu discloses the interconnect structure wherein the thickness of the compliant layer 70/71 is greater than the thickness of the outer portion 68 of the contact pad 84, fig. 2L.

Regarding claims 28-29, Wu discloses the interconnect structure wherein the contact pad 84 comprises a conductive metal 76, col. 9 line 14, and the compliant material 70/71 comprises a polymer, col. 8 lines 40-47, wherein the compliant layer comprises a dielectric material 56, col. 7 line 56.

6. Claims 1, 6 are rejected under 35 U.S.C. 102(b) as being anticipated by US 6211572 to Fjelstad et al.

Regarding claim 1, Fjelstad discloses an interconnect structure in fig. 1F comprising: a substrate 100, col. 5 line 44; a conductive contact pad 175, col. 6 line 59,

Art Unit: 2814

having a first elastic modulus (pad 175 comprises Cu, col. 6 line 66) disposed over a portion of the substrate surface 100, having an inner portion (150, col. 6 line 48) and an outer portion (where 110 is located) surrounding the inner portion; a compliant layer 140, col. 6 line 10, having a second elastic modulus lower than the first elastic modulus, disposed directly under the inner portion of the contact pad 175 but not under the outer portion of the contact pad, fig. 1F, the portion of the contact pad 175 over the compliant layer 140 having a thickness thinner than the thickness of the outer portion of the contact pad (layer 150 remains at the middle portion where 180 is located); and an insulative mask 180, col. 7 line 19, disposed over the contact pad 175, including an opening, fig. 1F, that exposes the inner portion of the contact pad 175, fig. 1E.

With respect to 'a second elastic modulus lower than the first elastic modulus', the compliant layer 140 comprises silicone, col. 6 line 30 would has the modulus substantially lower than the modulus of the copper layer 170.

Regarding claim 6, Fjelstad discloses the interconnect structure wherein the compliant material 140 has pores, aperture, and voids, column 6 lines 30-35.

### ***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over US 6433427 to Wu et al. in view of US 5187020 to Kwon et al.

Regarding claim 3, Wu discloses the interconnect structure wherein the contact pad comprises a conductive metal 76, col. 9 line 14.

But Wu does not disclose the interconnect structure wherein the compliant layer comprises a metal

However, Kwon discloses a interconnect structure wherein the compliant layer 15, col. 3 line 17, comprises a metal. At the time the invention was made; it would have been obvious to one of ordinary skill in the art to use the compliant layer teaching of Kwon with Wu's device, because it would have created a contact adequately compressed to assure a good, solid electrical contact and without permanent deformation of the compliant material as taught by Kwon in col. 3 lines 22-28.

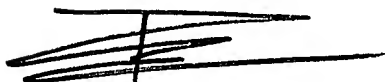
### ***Conclusion***

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thao X. Le whose telephone number is (571) 272-1708. The examiner can normally be reached on M-F from 8:00 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael M. Fahmy can be reached on (571) 272 -1705. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 2814

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'Thao X. Le', with several horizontal strokes underneath.

Thao X. Le  
Patent Examiner  
18 Oct. 2005